SHORT REPORT

Illness perceptions and outcome in mild head injury: a longitudinal study

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See Editorial Commentary, p 552

J Neurol Neurosurg Psychiatry 2007;**78**:644–646. doi: 10.1136/jnnp.2006.101105

Background: A range of neuropathological and psychosocial factors have been implicated in the aetiology and maintenance of post-concussional syndrome (PCS), with a growing consensus in the literature that this is a complex, multifactorial condition. The role of patients' perceptions in PCS has not been examined to date.

Objective: This longitudinal study examines the role of illness perceptions in predicting outcome following mild head injury, controlling for severity of injury, post-traumatic stress symptoms, anxiety and depression, using a logistic regression analysis.

Method: 73 patients were admitted to an accident and emergency department with mild head injury (Glasgow Coma Scale score 13–15; loss of consciousness <20 min; post-traumatic amnesia <24 h). Data on PCS symptomatology, illness perceptions, post-traumatic stress symptoms, anxiety and depression were collected after the injury and at the 3 month follow-up. Logistic regression analysis was used to evaluate predictors of outcome.

Results: Following a mild head injury, symptomatic patients who believe that their symptoms have serious negative consequences on their lives and will continue to do so, are at heightened risk of experiencing significant enduring post-concussional symptoms ($p < 0.001$). Adding measures of severity of injury, post-traumatic stress symptoms, anxiety and depression to the regression model did not improve prediction of outcome.

Conclusion: Whatever other physical or psychological factors may be involved, patients' perceptions of their illness early after head injury play a part in the persistence of PCS.

Head injuries are common in Western countries, with over a million per year in the UK alone.¹ Within this population, severity is unevenly distributed, with approximately 90% classified as "mild"¹ according to the following criteria: Glasgow Coma Scale² score 13–15, loss of consciousness <20 min and post-traumatic amnesia <24 h. Most patients with mild head injury do not require inpatient admission. Outcome is largely unproblematic, with return to normal functioning within a few days or weeks for most. However, an important minority of patients do experience ongoing symptoms that persist beyond 3 months, with substantial functional disability and social costs.³

Constellations of persisting neurobehavioural symptoms following mild head injury, such as headache, dizziness, fatigue, irritability, difficulty in concentration and performing mental tasks, impairment of memory, insomnia and reduced tolerance to stress, have been labelled "post-concussional syndrome" (PCS), although the aetiology of the condition has remained controversial. While some neuropathological studies have provided evidence for both diffuse axonal injury and mild

focal lesions in patients presenting with PCS, there is no conclusive evidence for direct association between imaging findings and persistence of symptoms.⁴ Neither is there evidence of neuropsychological deficits in the prediction or maintenance of symptoms.⁵ The evidence for persisting neuropathology as an aetiological factor in PCS is unconvincing, and PCS can therefore be considered a medically unexplained syndrome in which psychopathological processes are likely to be of considerable importance.

A large body of research supports a range of psychosocial risk factors in the development and maintenance of PCS. We report a study using a health psychology model which has been influential in guiding understanding of the psychological processes underlying outcome in a number of chronic physical illnesses and medically unexplained syndromes: the illness perceptions approach.⁶ Research using this model has demonstrated the importance of patients' perceptions of their condition in influencing outcome, frequently above and beyond measures of organic pathology.⁷ Patients with medically unexplained syndromes have been found to attribute high numbers of symptoms to their condition, and to believe strongly in their organic causality, their seriousness and their chronicity.⁸ The aim of this study was to examine, for the first time, the role of illness perceptions in PCS.

PATIENTS AND METHODS

This longitudinal study included patients admitted to the accident and emergency department with mild head injury during 2004–5. In all, 735 patients were invited to take part in the study. Symptomatic patients were recruited by post, and questionnaires were administered over the telephone. A total of 92 patients were interviewed at time 1 (1–3 weeks after the injury), and were checked for mild head injury criteria (Glasgow Coma Scale score 13–15, loss of consciousness <20 min and post-traumatic amnesia <24 h, using the Rivermead PTA protocol⁹ and then the Rivermead Post-concussion Questionnaire (RPQ¹⁰), the Illness Perception Questionnaire-Revised (IPQ-R¹¹), the Impact of Event Scale (IES¹²) and the Hospital Anxiety and Depression Scale (HADS¹³). The IPQ-R assesses the following dimensions of illness perceptions.

- **Identity.** Beliefs concerning the illness label or diagnosis and associated symptoms.
- **Cause.** Beliefs concerning the factors or conditions implicated in the aetiology of the illness.
- **Timeline.** Beliefs concerning the expected duration of the illness—whether it will be acute (such as influenza) or chronic (such as diabetes).

Abbreviations: HADS, Hospital Anxiety and Depression Scale; IES, Impact of Event Scale; IPQ-R, Illness Perception Questionnaire-Revised; PCS, post-concussional syndrome; RPQ, Rivermead Post-concussion Questionnaire

- *Consequences*. Beliefs concerning the effects an illness has on physical, social and psychological well-being.
- *Control/cure*. Beliefs concerning the extent to which the illness can be controlled or cured.

In all, 73 patients were successfully contacted at the 3 month follow-up (79%) and were administered the measure of symptomatic outcome (RPQ) and a measure of functional outcome for patients with head injury (Sydney Psychosocial Reintegration Scale¹⁴). Cut-offs derived from the criteria of the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn for post-concussional disorder were used to dichotomise participants according to their scores on the outcome measures, to enable logistic regression analysis. PCS was defined as:

- self-reported deficits in at least one cognitive domain on the RPQ;
- at least three other vegetative or emotional complaints on the RPQ; and
- self-reported functional impairment on the Sydney Psychosocial Reintegration Scale.

The mean age of the sample was 41.8 years and most patients were aged 25–59 years (mean (1 SD)). There were more women (42, 57%) than men (31, 43%) included in the study.

Statistical analysis

A hierarchical logistic regression was performed to examine relationships between severity variables of head injury (Glasgow Coma Scale, loss of consciousness and post-traumatic amnesia), anxiety and depression symptoms (HADS), post-traumatic stress symptoms (IES), head injury symptoms (RPQ scores) and illness representations (IPQ) at time 1, and a dichotomous outcome variable derived from the criteria of the *Diagnostic and Statistical Manual of Mental Disorders*, 4th edn¹⁵ for post-concussional disorder, described above.

RESULTS

Our results are based on 73 patients with mild head injury (42 females, 31 males; mean age 41 years). All patients were symptomatic at time 1. Fatigue (reported by 86% of participants), headaches (73%) and sleep disturbance (70%) were the predominant symptoms at time 1. As expected, both the average number of post-concussional symptoms (on the RPQ) endorsed per participant and the overall number of symptomatic participants diminished by 3 months. However, 18 patients (25%) met the criteria for persisting PCS at follow-up.

Bivariate analyses showed that the measures of the severity of head injury were not associated with either symptomatic or functional outcome. RPQ scores at time 1 were strongly correlated with Identity Scores at time 1 ($r = 0.859$; $p < 0.004$, Bonferroni-adjusted significance value), demonstrating that the majority of symptoms experienced after the head injury were attributed to the injury, and also with Consequences Scores at time 1 ($r = 0.526$; $p < 0.004$). RPQ scores at time 1 were not significantly associated with Timeline Scores at time 1.

A series of preliminary hierarchical multiple regression analyses demonstrated that Timeline beliefs significantly

predicted symptomatic outcome above and beyond HADS scores and IES scores, and that Consequences significantly predicted functional outcome above and beyond HADS scores and IES scores. The paradigm set out by Hosmer and Lemshow¹⁵ was then used to build the most accurate and parsimonious logistic regression model for predicting PCS from the predictor variables. Variables entered into this process were: symptoms (RPQ total score), Timeline, Consequences (acute/chronic), HADS scores, IES scores, loss of consciousness, Glasgow Coma Scale score and post-traumatic amnesia. The resultant model included the following variables: symptoms, Timeline and Consequences (acute/chronic).

Details of this final model are presented in table 1. A total of 73 cases were analysed and the full model was significantly reliable ($\chi^2 = 29.999$, $df = 3$, $p < 0.001$). R^2 estimates (variance in outcome status accounted for by the model) were 33.7% (Cox and Snell R^2 method), 58.9% (Hosmer and Lemshow R^2 method) and 50.1% (Nagelkerke R^2 method). Using the model, 93% of the non-PCS group and 61% of the PCS group were successfully predicted. Overall, the model successfully predicted 85% of cases.

DISCUSSION

In the present study, PCS at 3 months after mild head injury was found to be unrelated to either routinely collected clinical data on severity of injury or measures of psychological distress. One of the illness perceptions variables, Consequences, was, however, an independent predictor of outcome. When only RPQ total scores, Timeline and Consequences beliefs were included in the model, development of PCS was successfully predicted in 8 of 10 patients. Therefore, patients who believe that the symptoms they experience following a mild head injury have serious negative consequences on their lives and will continue to do so, are at heightened risk of experiencing enduring post-concussional symptoms. Notably, severity of the post-concussion symptoms in the initial post-injury period, while an important variable in the model, was not an independent predictor of outcome—it is the interpretation of their symptoms as serious and enduring that puts patients at risk of PCS. Adding information about the severity of the original injury, levels of anxiety, depression and post-traumatic stress symptoms did not significantly improve the model.

Our finding demonstrates the importance of taking into account patients' perceptions of their head injury when assessing risk of developing persisting symptoms. As a first response, it raises the question of whether clinicians should routinely provide information aimed at challenging these maladaptive beliefs, particularly information that helps normalise symptoms and emphasises the benign and time limited nature of any neuropathology. Additionally, our findings could be usefully applied in the treatment of patients with PCS as they show that while anxiety, depression and post-traumatic stress levels did not contribute to the prediction of PCS, there is frequent comorbidity between these disorders.

Lishman's thesis¹⁷ that organic factors predominate early in the natural history of post-concussional symptoms, while psychological and motivational factors become more important

Table 1 Logistic regression of illness perceptions onto persisting post-concussion syndrome

Model	B	SE	Wald	df	Significance	Exp B
Symptoms	0.048	0.040	1.443	1	0.230	1.050
Timeline	0.207	0.111	3.501	1	0.061	1.230
Consequences	0.207	0.064	10.411	1	0.001**	1.230

** $p < 0.01$.

as time goes on, is still appealing, but as this study has demonstrated, psychological factors may also be important in the period soon after injury. As our study has shown, the patient's subjective understanding of, and predictions about, their injury are worthy of inclusion in any explanatory model of PCS.

The Illness Perceptions Model has shown explanatory power in a range of other medically unexplained somatic syndromes (chronic fatigue syndrome, fibromyalgia, irritable bowel syndrome⁸) but this study is the first application of the model to inform a psychological understanding of the variation in outcome seen after mild head injury. We do not know how patients' perceptions of symptoms affect outcome, and further research is required. Recognition of the maladaptive cognitions that contribute to poor outcome of the sort suggested by this study will be helpful in the development of effective cognitive-behavioural interventions.¹⁸

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Competing interests: None.

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Received 30 June 2006

Revised 4 December 2006

Accepted 7 December 2006

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